

Title: APM 2.5 & Arduflyer V2.5 - Guide for ArduCopter & MultiRotor's

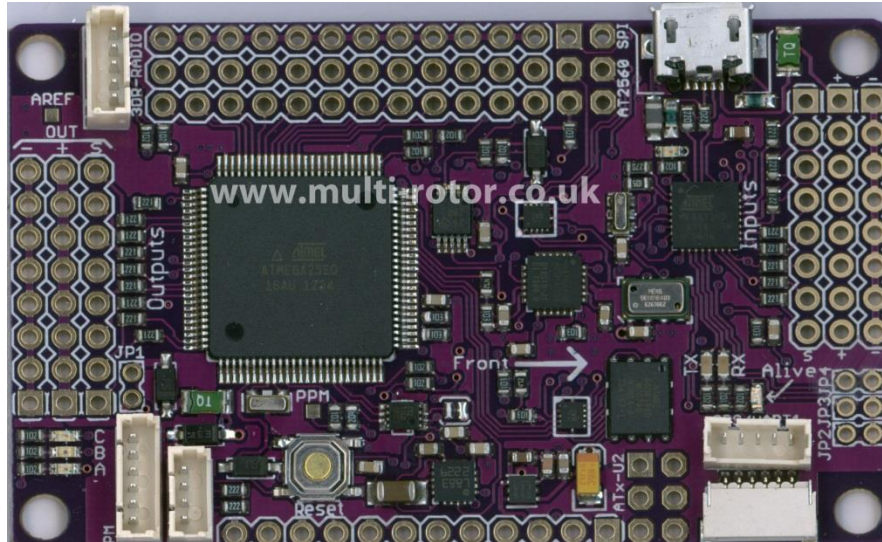
Document Name: APM 2.5 / Arduflyer V2.5 Guide

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Date: 18th Feb 2013

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Please Read: This guide is written for the APM 2.5 and the Arduflyer V2.5 board by RcTimer, used in conjunction with ArduCopter.

The guide details common hardware and software configurations to enable new users of the platform to get up and running with minimal effort. The guide is not intended to cover every conceivable aspect but focuses on the more popular uses and configurations. You should ensure you follow any relevant local legislation and guidelines

Most of this information can be found on various forums and wiki's, and links to relevant sources and credits have been given where relevant.

Latest versions of this file can always be found at: www.Multi-Rotor.co.uk

Disclaimer: You use this guide and information contained at your own risk. The guide is offered subject to errors and omissions and it is assumed that you have basic level understanding of MultiRotor's and electronics.

Version History

V1.0 - First release

V1.1 – Amended motor layouts.

Added version history.

Added CLI Test section.

V1.2 Updated GPS wiring information.

Added I/O diagram from Eagle Files.

V1.3 Fixed error in Attopilot pins.

Added details of new APM 2.5 Power Board.

Updated GPS info.

Updated MinimOSD V1.0 wiring information.

Updated pin out diagram to include Power Port.

V1.4 PPM SUM details updated

ATMega32U2 firmware details added.

Updated APM Power module

Vibration issues

Diode / Fuse problems

Minor typos and updates

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Hardware

The ArduPilot Mega 2.5 is a complete open source autopilot system, it allows the user to turn any MultiRotor capable of performing programmed GPS missions with waypoints. The OS / Firmware for the APM 2.5 for MultiRotor's is Arducopter.

Features:

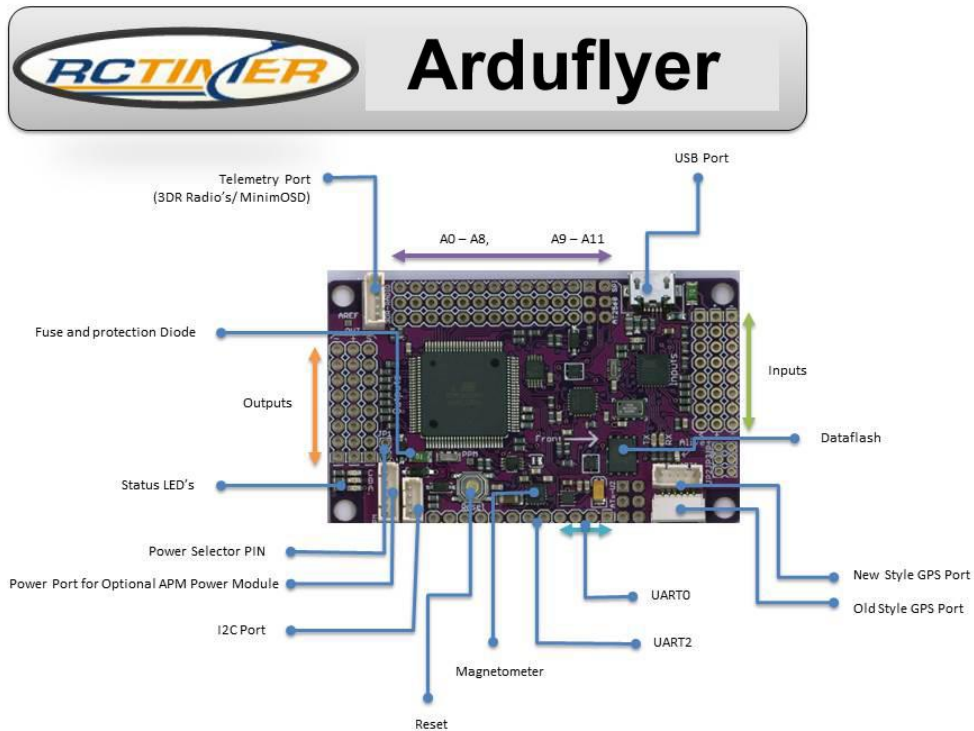
- Arduino Compatible
- 3-axis gyro, accelerometer and magnetometer, along with a high-performance barometer
- Onboard 4 MP Dataflash chip for automatic datalogging
- Digital compass powered by Honeywell's HMC5883L-TR chip, now included on the main board.
- Optional off-board GPS, (any TTL level GPS should work, main choice being the uBlox LEA-6H module).
- Invensense's 6 DoF Accelerometer/Gyro MPU-6000.
- Barometric pressure sensor, MS5611-01BA03, from Measurement Specialties.
- Atmel's ATMEGA2560 and ATMEGA32U-2 chips for processing and USB functions.

Datasheets:

- MPU-6000, Six-Axis (Gyro + Accelerometer) MEMS MotionTracking™.
- HMC5883L-TR, 3-Axis Digital Compass.
- LEA 6 GPS
- MS5611, MEAS High Resolution Altimeter

Depending on where you purchase your board will have an effect what cables are supplied. As a minimum the board is normally supplied with the GPS and Telemetry cables, either as one ended to make your own connections, or plugs on both ends for 3DR radios and GPS.

Connections



For more info see: <http://code.google.com/p/ardupilot-mega/wiki/APM25board>

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- A0- Sonar/ Ultrasonic
- A1- Voltage Sensor – Attopilot
- A2-Current Sensor – Attopilot
- A3- Optical Flow Sensor
- A4-Motor LED
- A5-Motor LED / Buzzer
- A6-Motor LED
- A7-Motor LED
- A8-Motor LED / Analogue RSSI
- A9-Camera Shutter
- A10-Camera Roll

A11-Camera Pitch

OP 1 – OP 8 – to ESC’s, (see motor mapping section)

IN1 to IN 8 - from RX

IN1 – Channel 1 Rx, Roll

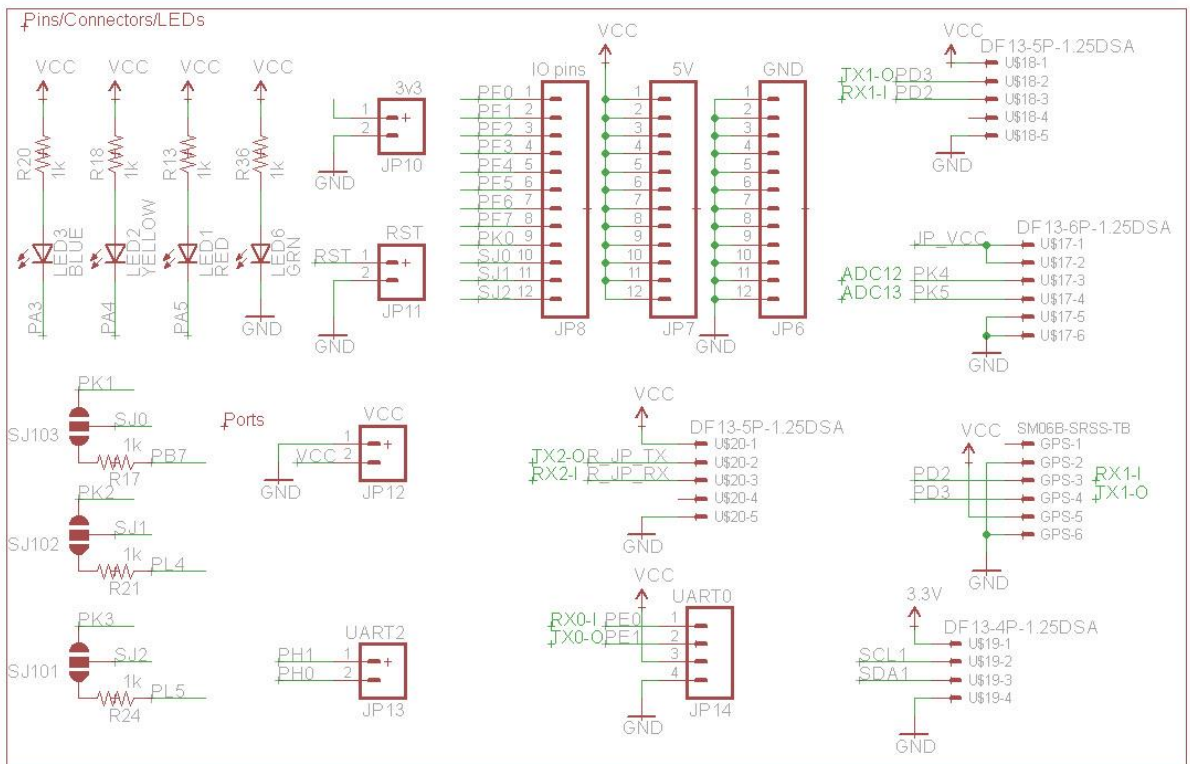
IN2 – Channel 2 Rx, Pitch

IN3 – Channel 3 Rx, Throttle

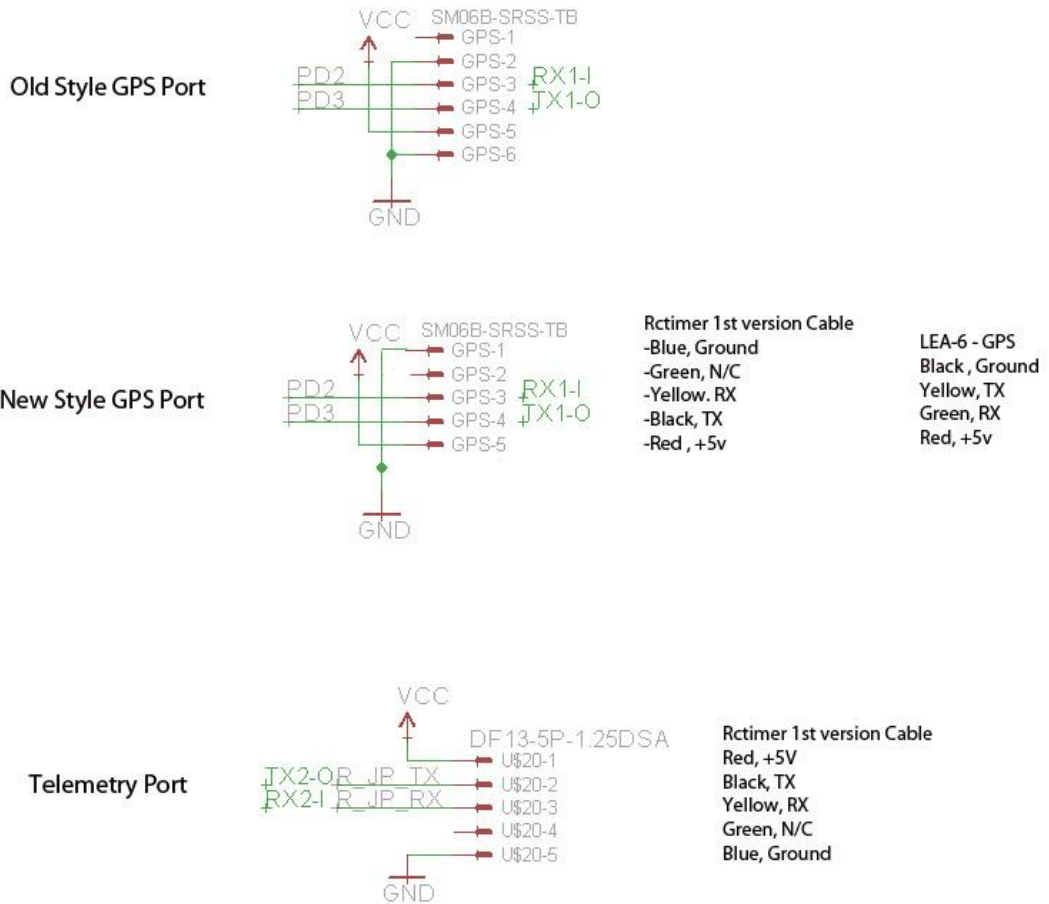
IN4 – Channel 4 Rx, Yaw

IN5 – Channel 5 RX, Flight Mode Switch

Note: IN5 – PPM SUM / CPPM input from RX – (See PPM SUM Section)



Rctimer APM 2.5 Clone ports

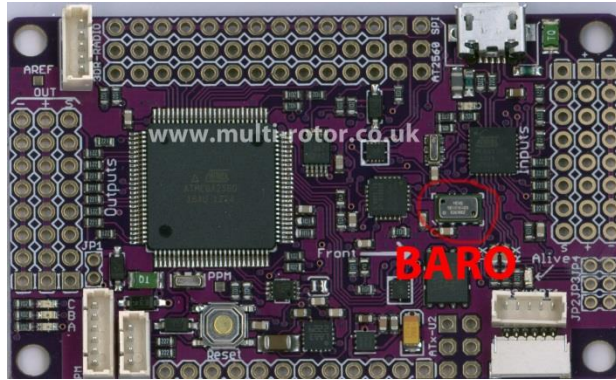


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Header Pins: Most boards are supplied without the header pins soldered to the board, this gives you the option of choosing straight or right angled headers. Soldering these although fiddly although not difficult, make sure you have a low wattage fine tipped soldering iron.

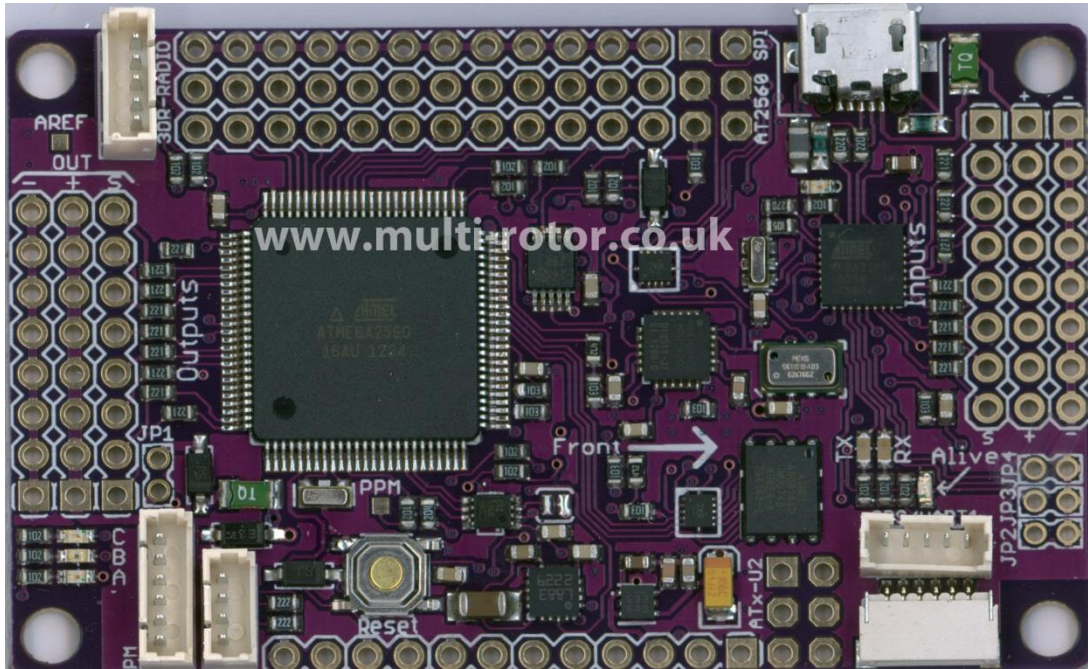
Cases: Cases for the APM 2.5 will fit the Arduflyer V2.5 and vice versa.

Important: You should cover your barometric sensor with a piece of foam and tape it to the board:

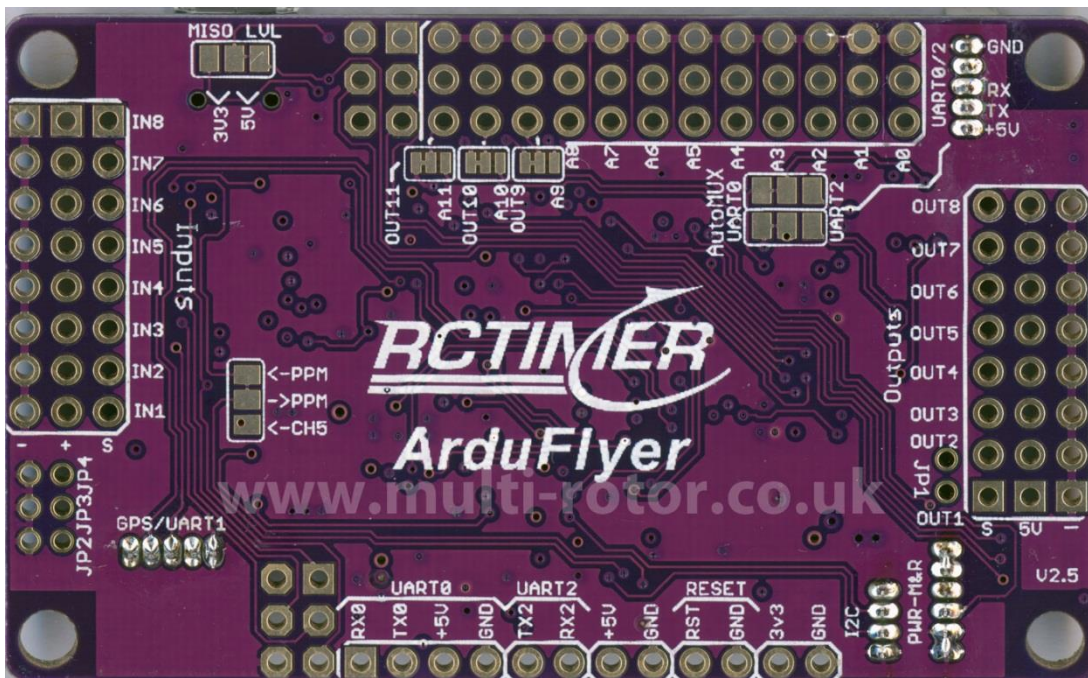


Board Layout

Front



Back



Installing Arducopter / Firmware

The APM 2.5 will normally come loaded with a boot loader. To update the board to the latest firmware this can be done within Mission Planner. To do this, connect the board with your USB cable to your PC. In most instances the drivers will auto install, if you have Windows 8, follow the guide at the end of this section. (Beta and pre-release versions of Arducopter will need to be loaded through Arduino).

Once the drivers have installed then click on Firmware tab and update the firmware in the APM 2.5 by clicking on the relevant configuration. (Note if this fails then you will have to update via Arduino see this link <http://code.google.com/p/ardupilot-mega/wiki/Code>)

Windows 8 drivers installation:

Windows 8 does not like unsigned drivers.. therefore many of the FC's and adapters that we use will not install automatically and trying to install the drivers will fail.. often without much indication of the reason..

There is a work around that disables the driver signature enforcement... in Windows 7 you had the option when you installed the device.. in Windows 8 it is enforced... so to disable... do the following..

1. Click on the Windows Key + R
2. Enter shutdown.exe /r /o /f /t 00
3. Click the "OK" button
4. The System will then restart to a "Choose an option" screen
5. Select "Troubleshoot" from "Choose an option" screen
6. Select "Advanced options" from "Troubleshoot" screen
7. Select "Windows Start-up Settings" from "Advanced options" screen
8. Click "Restart" button
9. System will restart to "Advanced Boot Options" screen
10. Select "Disable Driver Signature Enforcement" (press number on keyboard for option shown on screen)
11. Once the system starts, install the APM / FTDI / Arduino drivers as you would on Windows 7

Status LED's

The APM 2.5 has a number of status LED's. the main ones being A,B and C, which are Green, Yellow and Red respectively. There is also a power good LED.

LEDs:	Behavior:
Power	On when powered
TX	Shows data coming in USB/FTDI port
RX	Shows data going out on USB/FTDI port
A C	Fast flashing while calibrating gyros, then pause, then rotation flashing (about 45 seconds total).
B	Flashing = Calibrating. Solid on = Ready to fly but no GPS lock
C	GPS lock - C Flashing while waiting for GPS lock, Solid with GPS lock.
B C	Solid B and C = ready to fly with GPS lock

Mission Planner

APM Planner can be downloaded from here: <http://code.google.com/p/ardupilot-mega/downloads/list>

Mission Planner is used to upload new firmware, for calibrating your APM 2.5 and checking and calibrating your radio.

The Planner can also be used for following:

- Updating firmware
- Calibrating radio
- Calibrating horizontal and magnetic settings
- Setting up Attopilot Voltage and Current monitor
- Setting up Ultrasonic sensor
- Tuning PIDs (more on this later in the document)
- Setting flight modes
- Mission Planning
- Ground Station

And much much more..... most of the settings are explanatory, but the Planner is quite powerful and can be used for full ground station work or setting up full autonomous flight.

We suggest your refer to the Ardupilot Mega Wiki Guide here <http://code.google.com/p/ardupilot-mega/wiki/Mission>

Power considerations

The power jumper JP1 when present connects the power from the ESC's +5v rail to the +5v power rail on the Inputs.

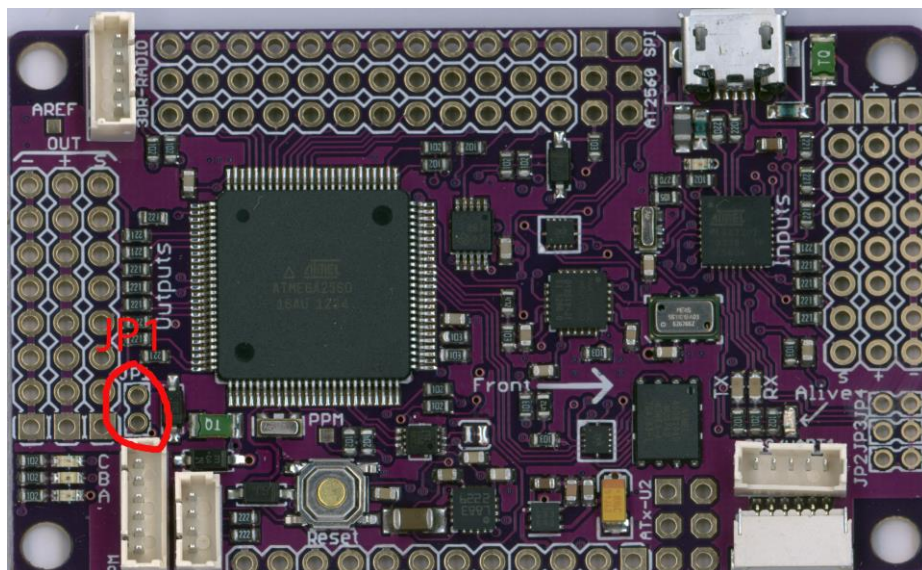
When JP1 is connected the board is powered from the Output Rail. When testing you will probably be powering the board via your USB cable while you set it up.

On the MultiRotor you will need to power the board with your LiPo battery going through one of your ESC's with JP1 present. If JP1 is removed then you can power the board with a suitable UBEC connected to one of the input 5v pins.

If you have noisy ESC's then powering the board and sensors via a separate UBEC or new APM Power Module may be a more preferable option.

The APM 2.5 itself draws very little power, typically 200ma.

Warning: Do not exceed 6.0V DC of power supply input voltage or you will damage your board.



GPS

Almost any TTL GPS units will work with the APM 2.5. The GPS connects to either the old style GPS port or the new style GPS port depending on what cables you have. The APM 2.5 in Arducopter tries to configure the GPS in the first instance on boot. If this does not work, then you may have to change the baud rate in Arducopter using Arduino, or the baud rate of the GPS if it has an onboard EEPROM. The default baud rate for the GPS port is 38400 baud.

LEA 6

A cable is available to connect the LEA 6 to the APM 2.5 with ready made ends. Rctimer supplies this cable with all new boards as from Nov 2012. (cables are also available from sources at the end of this guide).

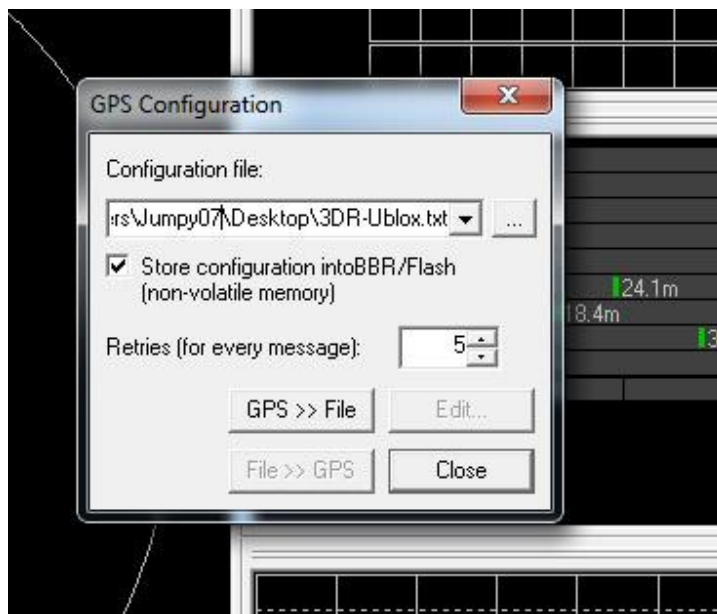
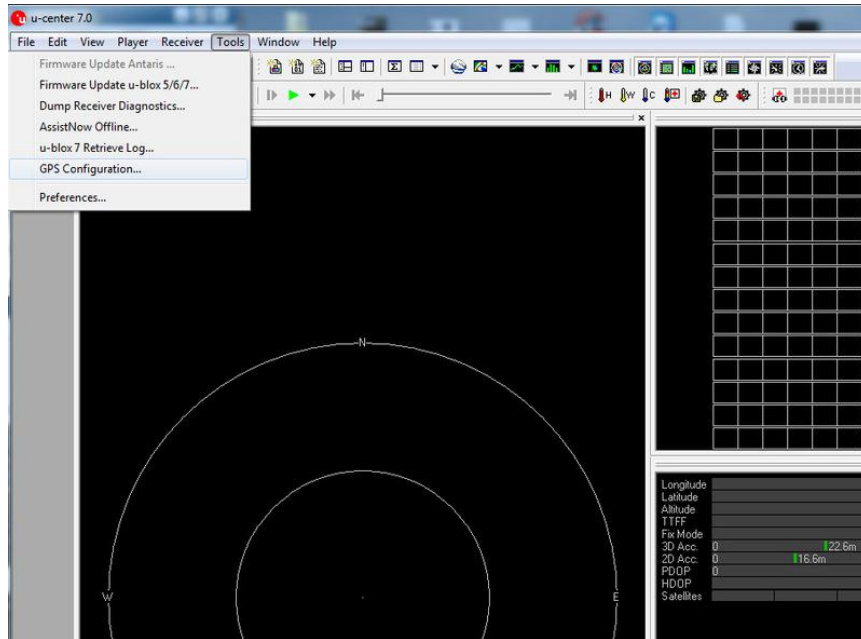
A special configuration TXT file is available from 3DR to optimise the LEA 6 for MultiRotor use.

To enable you to upload the config file to the GPS you will need an FTDI adapter and make a suitable cable to connect to the LEA 6.

Download the 3DR config from here : http://ardupilot-mega.googlecode.com/git/libraries/AP_GPS/config/3DR-Ublox.txt

You will need a copy of UCentre which you can download from here: http://www.u-blox.com/images/Support/Support_Products/EvaluationSoftware/u-centerssetup-7.0.2.1.zip

To upload the text file to the GPS you can do this from the MENU.. as shown below:



You then hit "Send to GPS", you will get some errors, and eventually it will complete, then go back into U-Centre and make sure you save the config in the configuration view to EEPROM.

Note: The baud rate will now have been changed to 38400.

After this has been done, you will no longer see information on number of Sats etc, but should see a position fix.

You can now connect the GPS to the APM 2.5

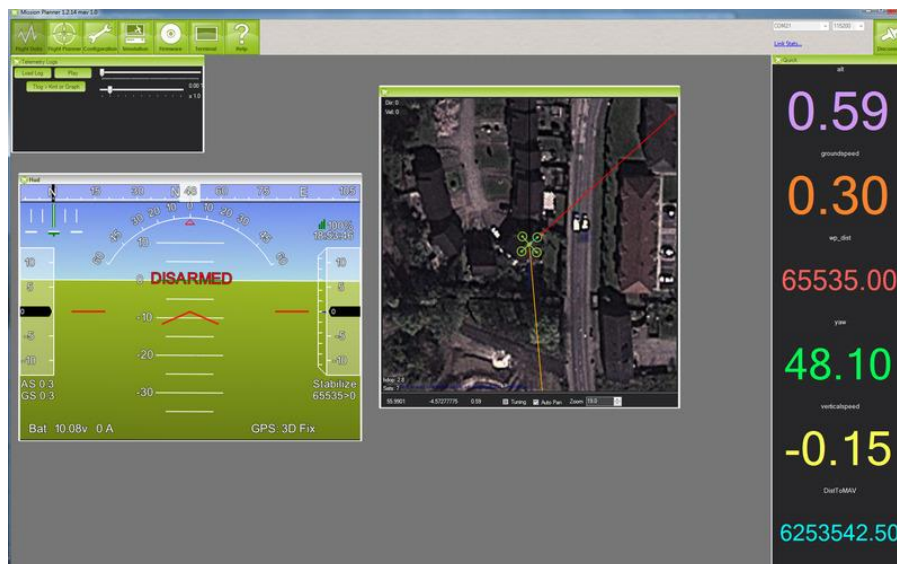
The config turns off a lot of GPS sentences that are not required to minimise the overhead on the APM. It also optimises the GPS for the APM and changes refresh rate, baud rate, lock refresh etc.

Please note if you load this file onto your GPS then it may not work with other non APM FC's until you have reset it.

The original APM 2.5 from Rctimer came with two cables with plugs with bare ends.... they are both the same, the GPS plugs into the "New Style GPS" port on the APM 2.5.

The latest Rctimer APM 2.5 from Nov 2012, comes with plugs on both ends of the cables and you will either need to cut this to add your FTDI adapter or source an additional cable. (Sources for these are shown at the end of the guide).

Now power your APM by the USB socket and the red light on the GPS should light up, the blue status light on the APM will flash and then go solid when it has a 3D fix, you may notice in Mission Planner that you will get a location fix before it says fix in the HUD as the HUD will only say fix when it has a 3D fix, whereas the Google map will show a location when it has a 2D fix.



Neo 6 V1

The NEO 6 V1 has now been replaced with the V2, however the original GPS will work with the APM 2.5 with a suitable cable. The main issue with the V1 is that it had a small battery and no EEPROM for saving settings. Therefore after a few days the GPS would do a cold start taking longer to get a fix,

Neo 6 V2

This is normally the GPS supplied by Rctimer in its latest Arduflyer V2.5 & GPS bundles, the GPS should be plug and play with the latest cables supplied. You should not need to change any settings on the GPS.

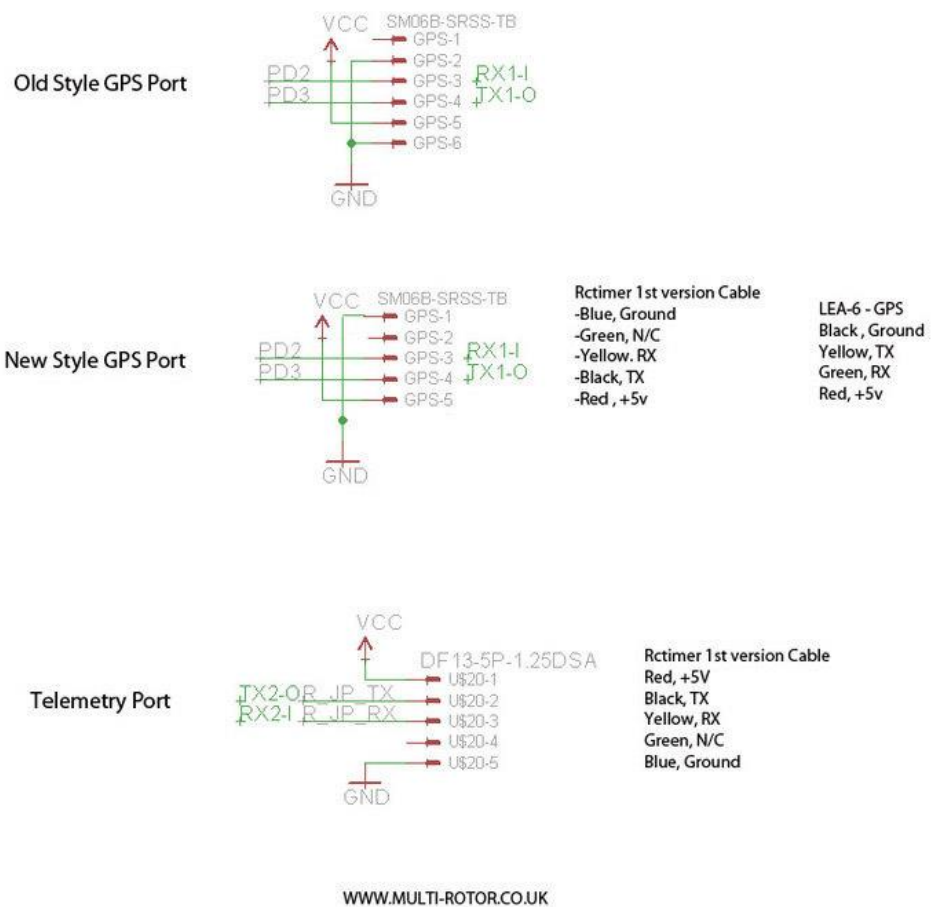
The V2 NEO 6 has very similar performance to the V1 but has the added advantage of having an external EEPROM for saving settings and a large antenna. It also has a slightly larger battery saving current position for quicker warm starts. The Neo 6 V2 offers very good price performance.

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The 3DR TXT file config although written for the LEA-6 can be used on the NEO 6, although some errors are reported the file works in much the same way.

MediaTek MT3329 V2.0

This is normally the GPS supplied by 3DR at this time for the APM 2.5. The new MediaTek MT3329 GPS unit has custom firmware which allows the unit to output an efficient and very compressed binary protocol. (This firmware will only work with the ArduPilot Mega AutoPilots). By default the baud rate set to 38400 bps and custom binary protocol.



PPM SUM / CPPM

There are two methods of configuring the board for PPM SUM / CPPM. Some people have reported that method 1 works fine in most instances, but if you are having problems then Method 2 should be employed.

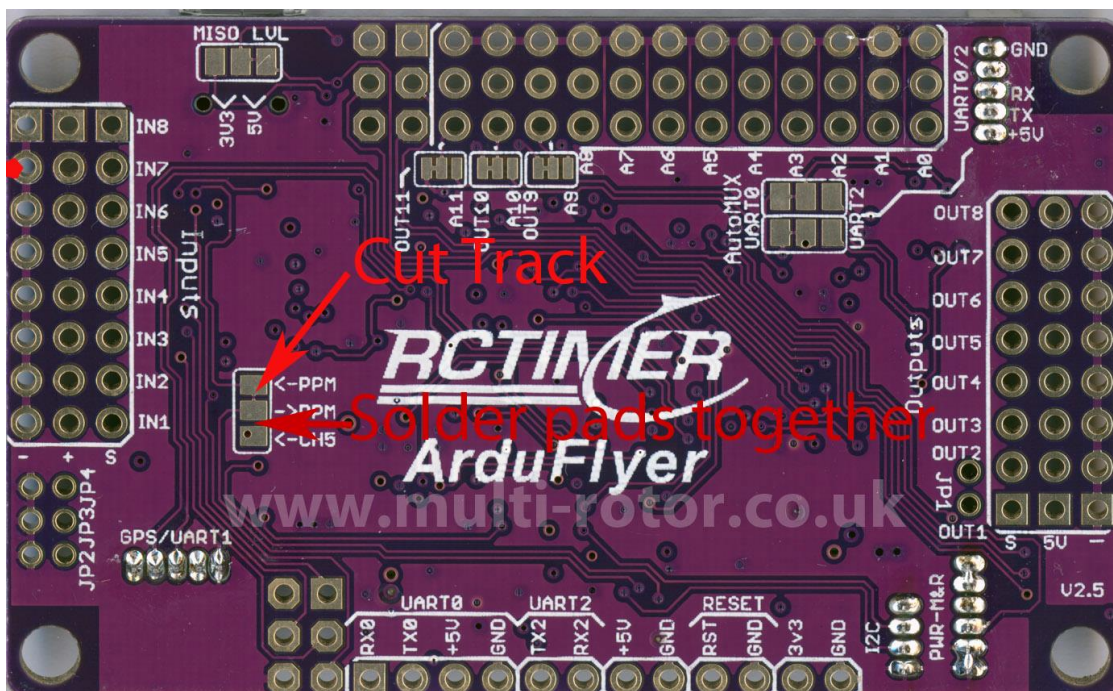
Method 1:

Link the signal pins on channels 2 & 3 and use channel 1 as PPM SUM input.

Method 2:

On the APM 2.5, if you look with a magnifier you will see the little trace between the <-PPM and -> PPM pads. You need to cut this and then solder the ->PPM and <-CH5 pads together. You then connect your PPM SUM / CPPM receiver then connects to IN5 / Channel 5.

Note: It is recommended that you do a manual ESC calibration when using PPM Sum / CPPM.



PPM ENCODER / Atmega32U2

There has been much debate about the PPM Encoder firmware on Rcggroups with reference to the Arduflyer V2.5 board.

Early boards were not installed with the latest firmware in the Atmega32U2. This made it difficult to update the firmware in the Atmega32U2, this has since been rectified in latest boards made from Jan 2013 onwards.

No upgrade of the Atmega32U should be necessary unless you have a Futaba receiver, which is known to have problems with some versions of the firmware.

A very useful thread on the subject including effected receivers can be found here:

<http://diydrones.com/forum/topics/is-it-necessary-to-update-flash-the-atmega32u2-ppm-encoder-on-an?id=705844%3ATopic%3A1069690&page=3#comments>

<http://code.google.com/p/ardupilot-mega/wiki/Encoder>

Sonar / Ultrasonic / Optical Flow

The APM 2.5 is **NOT compatible** with the cheap HC-SR04 ultrasonic sensors as used on many other Flight Controllers.

APM 2.5 supports the MaxSonar sensors for low altitude hold, typically the sensor works below 10 metres and above 10 metres the barometric sensor is used. The MaxSonar sensors are far superior to the HC-SR04 sensors.

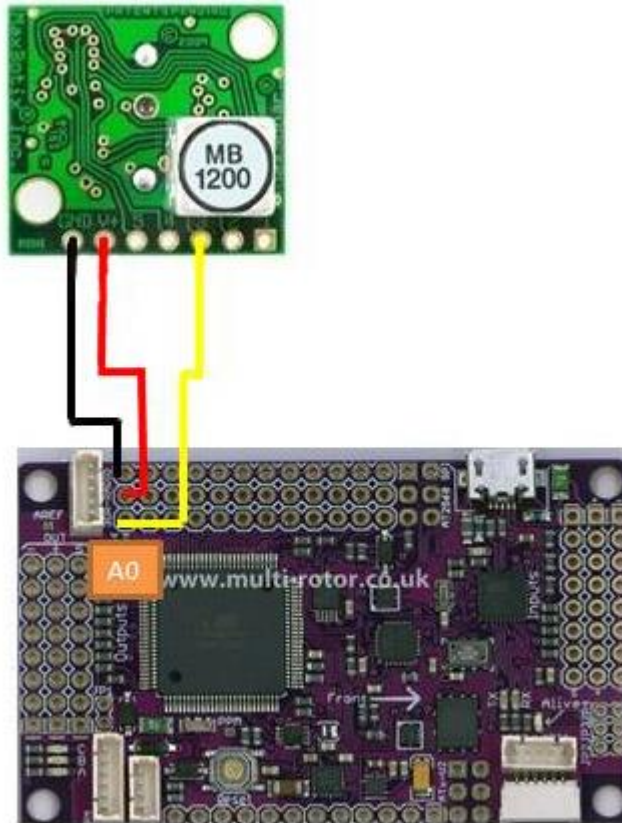
The Sonar sensor most commonly used on the APM 2.5 is the MB1000 LV-MaxSonar-EZ0 High Performance Ultrasonic Range Finder. The LV-EZ0 and the higher performance XL-EZ10 are also supported by the APM 2.5.



- Resolution of 1 inch
- 20Hz reading rate
- 42kHz Ultrasonic sensor measures distance to objects
- Virtually no sensor dead zone, objects closer than 6 inches range as 6 inches
- Maximum Range of 254 inches (645 cm)
- Operates from 2.5-5.5V
- Low 2.0mA average current requirement
- Small, lightweight module
- Designed for easy integration into your project or product
- Widest beam of the LV-MaxSonar-EZ sensors

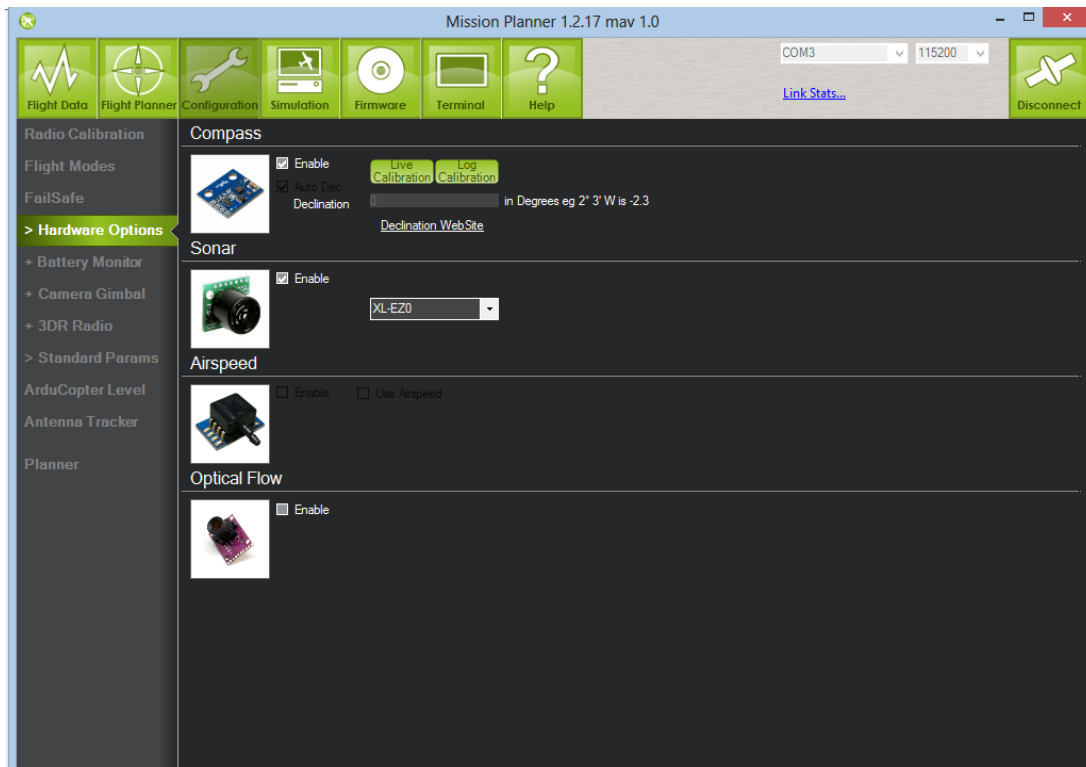
The sensor requires only three connections to the APM 2.5, 5V, Ground and signal from AN on the sensor to the signal pin of A0 as shown in the diagram below. The sensor comes without a cable connected and you will have to solder your own connections.

XL MaxSonar EZ0



Datasheet: http://www.maxbotix.com/documents/MB1000_Datasheet.pdf

Once you have connected the sonar sensor then you have to enable it in Mission Planner as shown below. Once enabled you can test the sensor in the terminal view > Test > Sonar.



Optical Flow Sensor

To improve position hold an optical flow sensor is supported, the sensor is essentially a small camera with a fixed lens.

Input for the sensor in the APM 2.5 is A3.

Support for this was released for the APM 2.5 in version 2.8+ of ArduCopter. A special flight mode OF_LOITER is available to enable the sensor.

There are a number of known limitations and issues you should be aware of:

- The sensor does not work well in dull lighting environments
- A fixed-focus lens is used meaning it cannot focus on objects closer than 30cm.
- Rotating the sensor will confuse the sensor

I do not intend to detail any more in the guide as I believe it has a limited application, but if you wish to find out more about the Optical flow sensor see this link:

http://code.google.com/p/arducopter/wiki/AC2_OptFlow

3DR Radio's

3DR Radios will work for Ground Station Support and connection to APM Planner. There are currently two frequencies available 900Mhz and 433Mhz and you should choose the one that meets your countries regulations. 433 Mhz is recommend for UK and Europe.



The 3DR Radios connect to the telemetry port on the APM 2.5, some of the clone radios now appearing on the market have different connections from shown above, the units currently supplied by Rctimer in their latest bundles have a socket similar to the GPS. The cable supplied by Rctimer as part of their bundle offer makes the radios wiring plug and play. If you source your radios elsewhere or use genuine radios then you will need to make a suitable cable.

The 3DR radios consist of a Remote and Local unit, the Local Unit is the USB one and the Remote is the smaller module.

Before you can use the modules they will need configured, to do so you will need to plug the USB one into your PC and the remote one will need powered by 5V + and Ground connection from the Crius.

Remember and connect the antennas first as not doing so will damage the modules.

Plugging the USB local module into your PC should auto install the drivers and a comm port will be configured automatically. If ensure check your ports in Devices. (Control Panel > System > Devices). If you need drivers they can be found here <http://www.ftdichip.com/Drivers/D2XX.htm>

There are two ways to configure the modules, either using APM Planner or the 3DR tool available. The 3DR tool can be found here <http://vps.oborne.me/3drradioconfig.zip>

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The First step is to configure the baud rate of both devices, then the 3DR's should be set at 57600 baud. Most 3DR's are set up as default at 57,600 so to connect first time try this first.

If you have changed the baud rate the and saved the baud rate on the local and remote you will need to reconnect at the new baud rate.

Caution: Make sure you change the settings for both remote and local at the same time. If the two are not the same you will not be able to connect to the remote. If you do change the settings and get them out of sync, all is not lost but you will need an FTDi adapter to change the settings on the smaller module.

Set TX power to 20 (which is equal to 100mw)

The picture below shows the settings for a 433Mhz 3DR radio set in Mission Planner connected to COM13



You should ensure that your radio's, frequency and settings etc are setup legally for the country of operation. For more info see below:

Region	Radio Model	Settings	Standard
USA	3DR 900	MIN_FREQ=902000 MAX_FREQ=928000 NUM_CHANNELS=50	FCC 15.247
Canada	3DR 900	MIN_FREQ=902000 MAX_FREQ=928000 NUM_CHANNELS=50	RSS-210 Annex 8.1

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Australia	3DR 900	MIN_FREQ=915000 MAX_FREQ=928000 NUM_CHANNELS>=20	LIPD-2000 item 52
Australia	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790 TXPOWER<=14	LIPD-2000 item 17
Europe (most countries)	3DR 433	MIN_FREQ=434040 MAX_FREQ=434790 TXPOWER<=8 NUM_CHANNELS>=30	ETSI EN300 220 7.2.3
Europe (most countries)	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790 TXPOWER<=8 DUTY_CYCLE=10	ETSI EN300 220 7.2.3
United Kingdom	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790 TXPOWER<=8 DUTY_CYCLE=10	IR2030/1/10
New Zealand	3DR 900	MIN_FREQ=921000 MAX_FREQ=928000	Notice 2007, Schedule 1
New Zealand	3DR 433	MIN_FREQ=433050 MAX_FREQ=434790	Notice 2007, Schedule 1
Brazil	3DR 433	MIN_FREQ=433000 MAX_FREQ=435000 TXPOWER<=8	Resolução ANATEL nº506/2008
Brazil	3DR 900	MIN_FREQ=902000 MAX_FREQ=907500 NUM_CHANNELS>=11	Resolução ANATEL nº506/2008
Brazil	3DR 900	MIN_FREQ=915000 MAX_FREQ=928000 NUM_CHANNELS>=26	

3DR Status LEDs¶

The 3DR Radios have 2 status LEDs, one red and one green. The meaning of the different LED states is as follows:

- green LED blinking - searching for another radio
- green LED solid - link is established with another radio
- red LED flashing - transmitting data
- red LED solid - in firmware update mode

MinimOSD

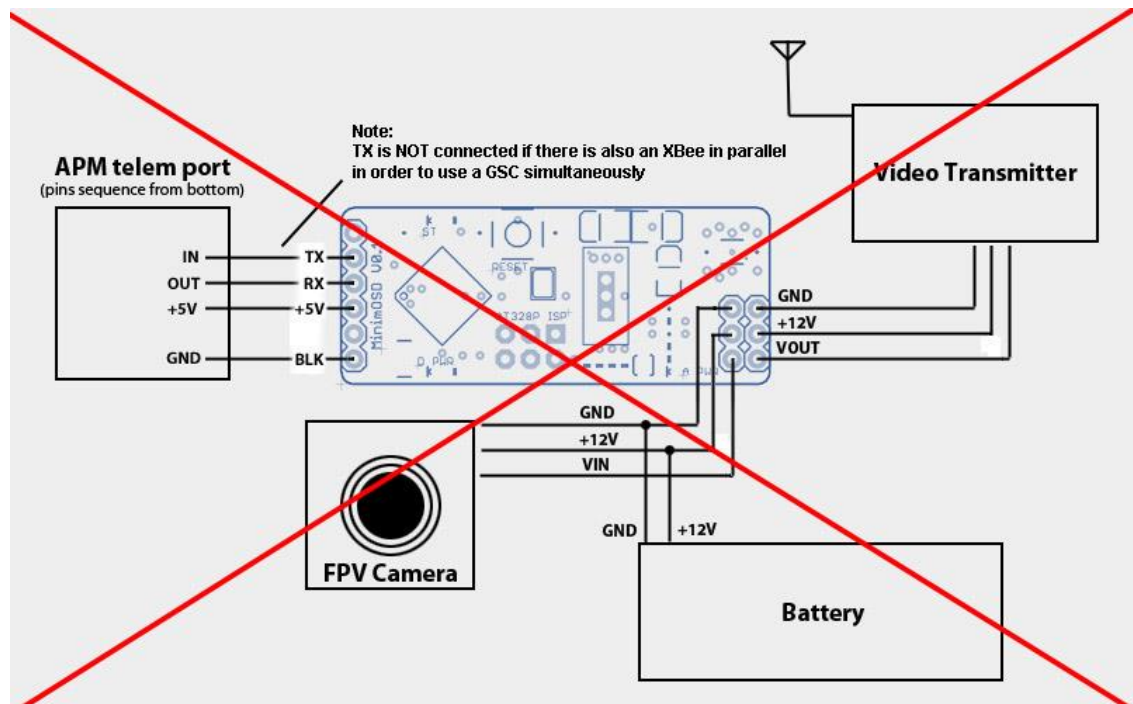
MinimOSD connects to the Telemetry port, **only the RX** from the OSD is connected to the TX of the Telemetry port if you also have 3DR Radios connected as well.

If you are not using telemetry then connect the TX and RX.

Only one device can be a talker on the port at time.

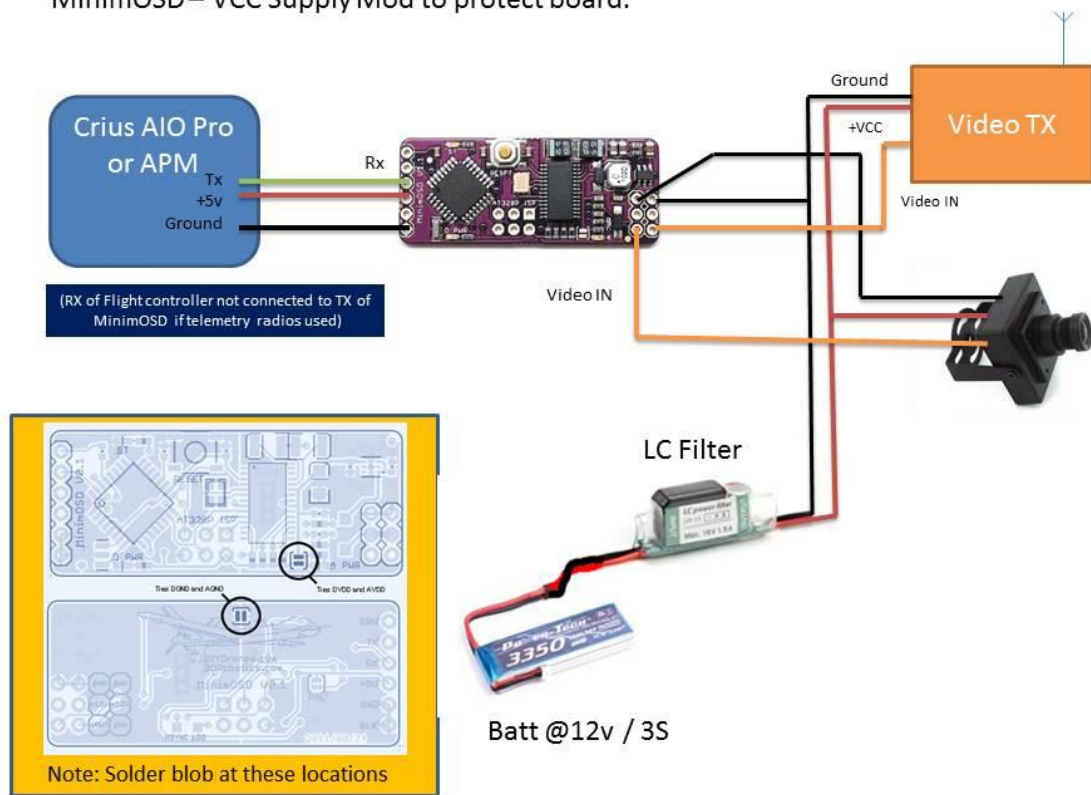


If you are using an early V0.1 board or one of the Chinese clones based upon its design, (Which maybe labelled as V1.0), then here is a well know design flaw on the MinimOSD and its recommended that you do not follow the guide on the Wiki as shown below:



Instead the OSD should be connected as show:

MinimOSD – VCC Supply Mod to protect board.



Jumpy07 @ Multi-Rotor.uk

Note: Diagram above assumes a 12v camera.

If you are using a new version V1.0 of the MinimOSD then follow the Wiki as standard:

<http://code.google.com/p/arducam-osd/wiki/minimosd>

Analogue RSSI is normally handled by the APM 2.5 and passed over Mavlink to the MinimOSD. Analogue RSSI can be input on pin A8 and should not exceed 3.3v. To enable the APM to work with RSSI input on A8 then LED's need to be disabled on this input.

The APM 2.5 cannot process **PWM RSSI** as output by some RX's such as FrSky. Therefore an alternative way is to modify the MinimOSD to provide an input for the OSD and use an alternative software on the MinimOSD.

To date ONLY PWM RSSI as output from FrSKY Telemetry Receivers has been found to work.



To work with MinimOSD and a PWM RSSI input, an alternative version of the MinimOSD is available here <http://code.google.com/p/minimosd-extra/>. You will need to configure and install as detailed in the link. (If you do not require RSSI then the standard OS Build for the MinimOSD will be fine). To configure the OSD you will need an FTDI adapter to load and configure the firmware.

Note as standard MinimOSD's baud rate is 57600 which is the default setting the Telemetry port on the APM 2.5.

For more info on MinimOSD see [here http://code.google.com/p/arducam-osd/wiki/minimosd](http://code.google.com/p/arducam-osd/wiki/minimosd)

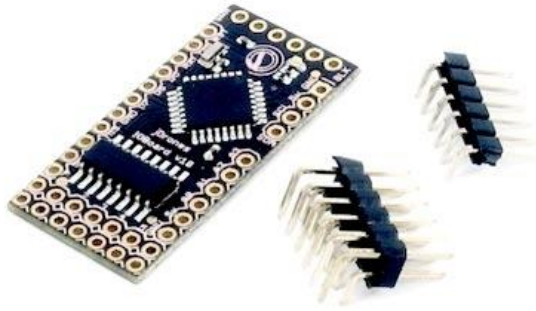
JD-IO Board / FrSky Telemetry

LED Driving

The JD-IO Driver Boards is great if you need to drive LED strips, LEDs, Lamps, Relays or similar devices. This board is fully Arduino compatible and has 6 high power outputs and can handle up to 42 Volts and 500mA / output pin. For more information see this guide http://www.idrones.com/jDoc/wiki:code_ioboard

FrSky Telemetry

The JD-IO takes the Mavlink data and converts it into FrSky telemetry format that you can then input into the FrSky telemetry series RX's on the telemetry serial port.



The FrSky telemetry receiver then sends the data via the radio link to your FrSky 2.4Ghz telemetry Tx's such as the DHT-U module, LCD display connected to a DHT or telemetry modified receiver with DHT and ER9X.



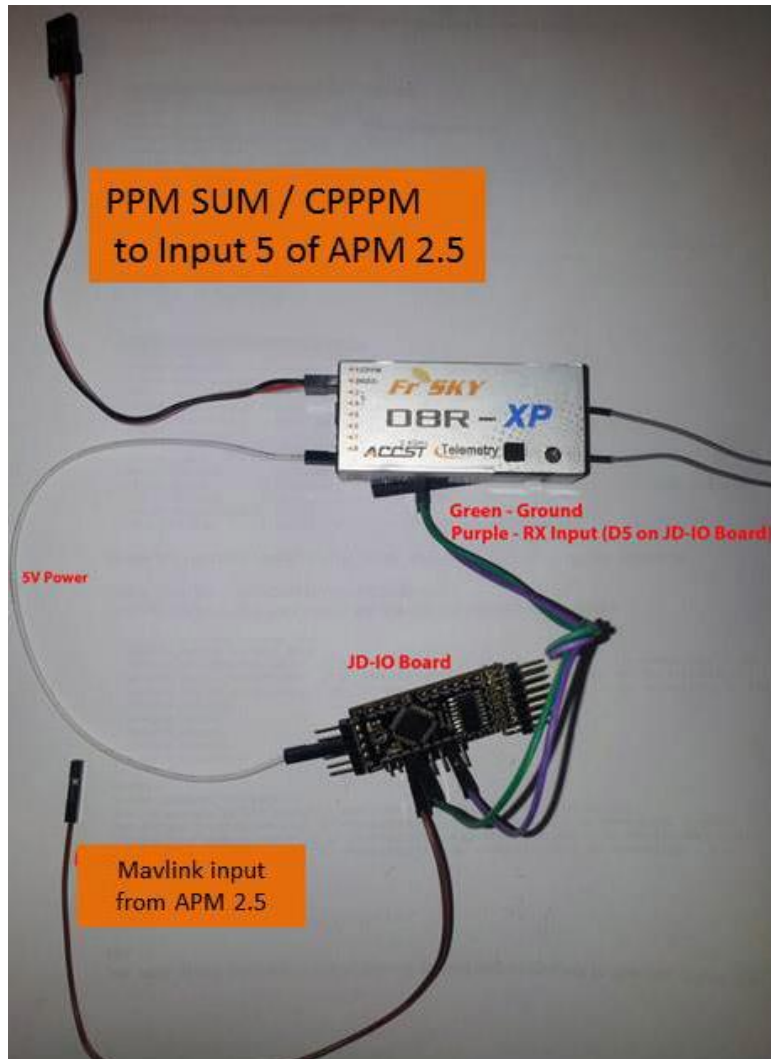
The JD-IO is still being developed, but at the moment current messages that are already working over FrSky telemetry are:

- Temperature
- Accel X, Y, Z
- Running time

APM 2.5 / Arduflyer V2.5 - ArduCopter Guide

- Altitude
- Groundspeed
- Lat / Lon

For more info on the JD-IO Board see this link: <http://www.buildyourowndrone.co.uk/JD-IO-board-v1-0-Driver-board-p/acq-ioboard.htm>

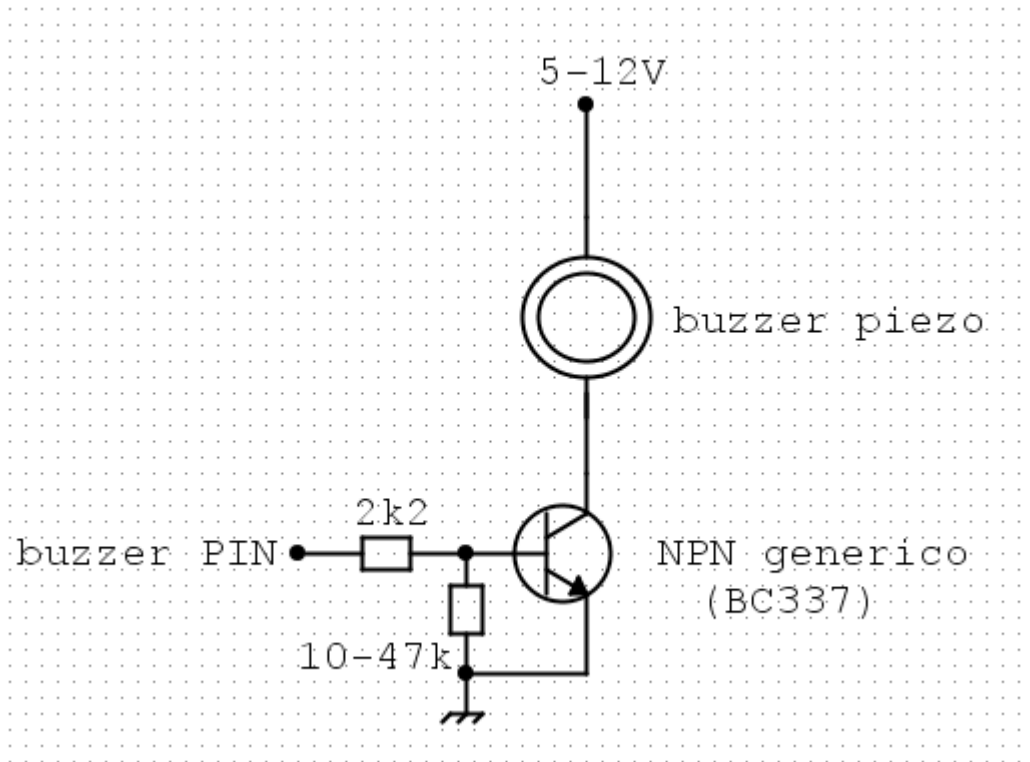


Mavlink out is found on the Telemetry port, only the TX on the APM 2.5 needs connected to the JD-IO board.

Buzzer

It is possible to connect a Piezo buzzer to indicate arming, disarming and low voltage on the APM 2.5. This can be connected between Pin A5 and using a 1k resistor to ground.

An alternative and safer connection can be made using a NPN transistor to protect the APM 2.5 output on Pin A5 as shown below:



You can also buy suitable buzzer and ready made circuits on Ebay.

AttoPilot / APM Power Board

APM 2.5 is capable of measuring Voltage and Current by using the Mini Attopilot Module or by using the new APM Power Module.

Attopilot

ArduCopter is already configured for using the Attopilot on Pins A1 and A2

There are a number of Attopilot modules available in various current sizes, please pick one that suitable for the load on your MultiRotor.

This data is also passed onto Mavlink and can be viewed in Mission Planner and MinimOSD if configured.

- V-Pin of the Attopilot connected to the A1 pin of the APM 2.5 board
- I-Pin of the Attopilot connected to the A2 Pin of the APM 2.5 board
- GND of Attopilot to Ground on APM 2.5 board
- IN+ from battery
- Out + to ESC, BEC's etc
- Heavy Ground to Battery



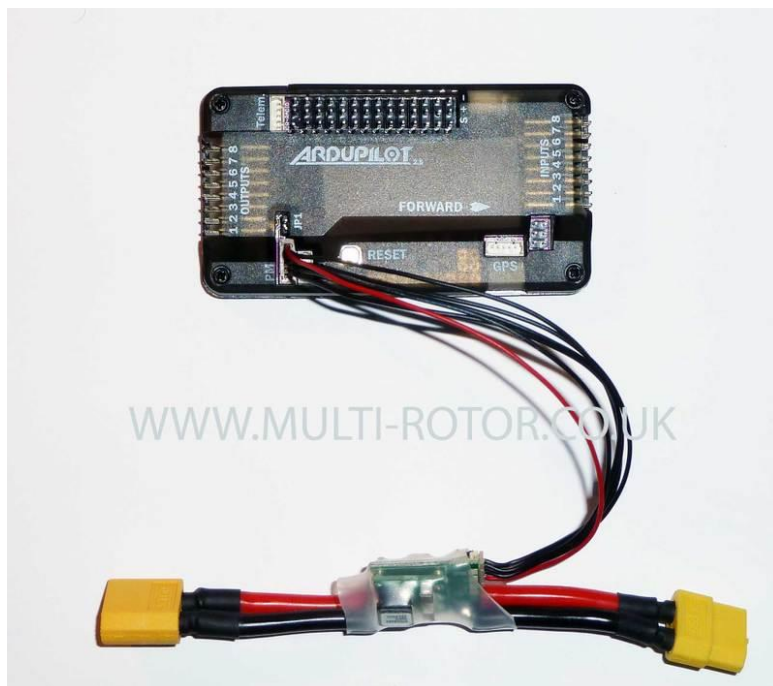
Attopilot

APM Power Module

The new APM Power module launched in late Nov 2012 provides power to the APM board and also Voltage and Current measurement.



The new module plugs into what was previously known as the mystery port or power port. It is available with XT60 or deans connectors. It is a simple way of providing the APM 2.5 with clean power from a LiPo battery as well as monitoring current consumption and battery voltage measurements.

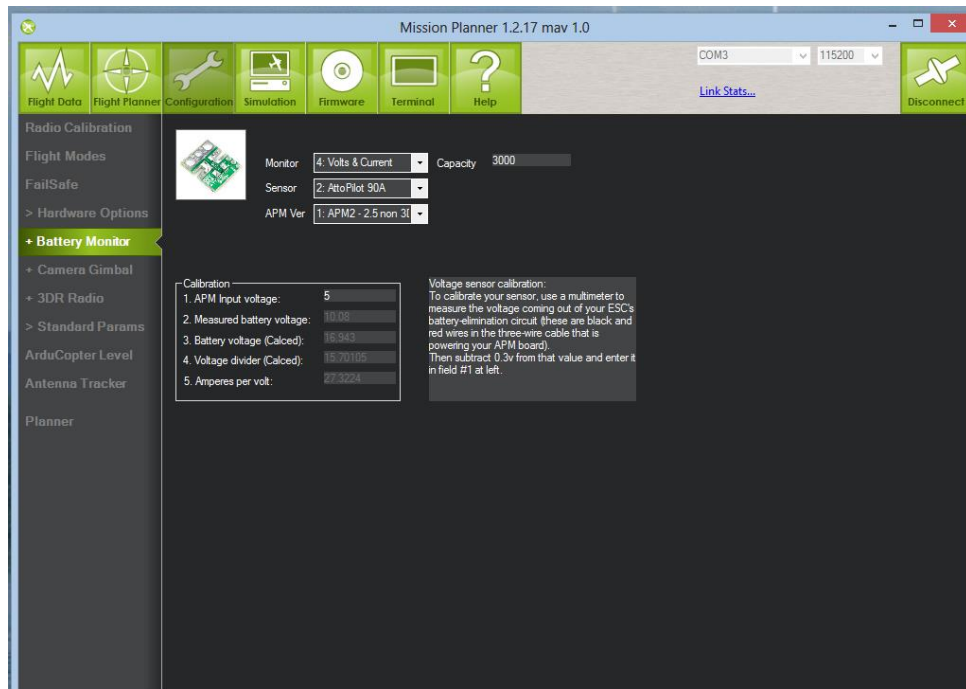


A 6-pos cable plugs in the power port on the APM and an inline battery connector to your LIPO. This will ensure that you have no brown-outs due to insufficient BEC power from your ESCs, and makes current and voltage monitoring easy.

If you are using this board then you need to remove the jumper from JP1. This will isolate the power supplied from the BEC in the ESC's from the output rail.

The power module's maximum load is recommended at 2 amps max, it is not intended to power servo etc.

Both the Attopilot and Power Module can be configured in Mission Planner.



CLI / Testing

Mission Planner has a very useful and powerful testing interface which can be found in the terminal window. Terminal / CLI only works over USB only.

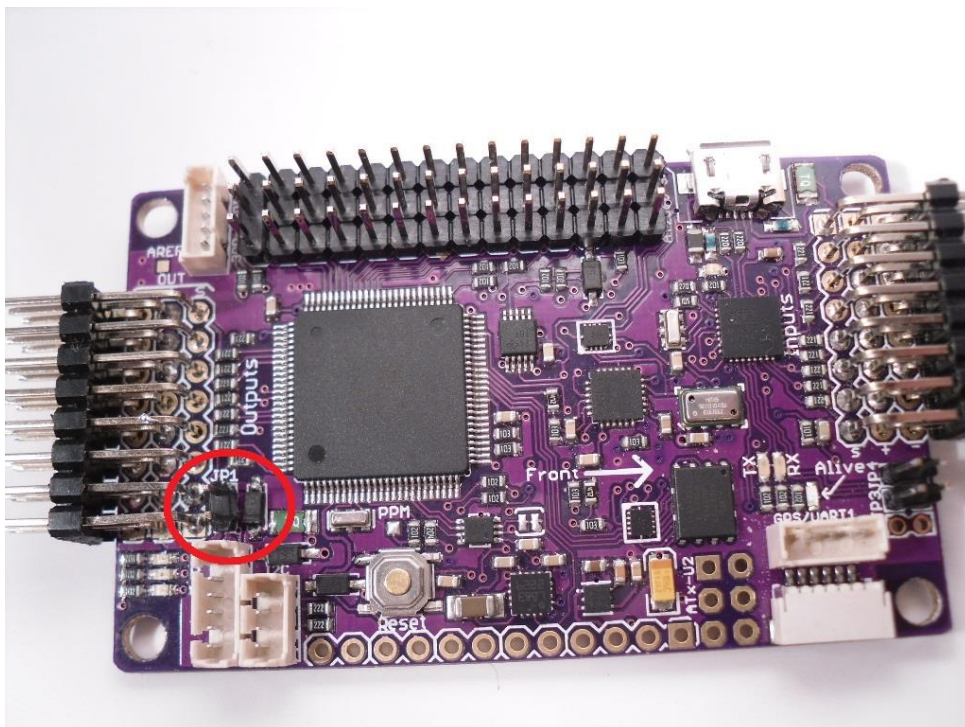
- Plug in your APM to your PC with the USB cable
- Connect to the relevant comm port.
- Click on terminal on the top menu,
- Click on “Tests”
- Type “help” and hit return for a full list of test available.

The tests are useful to check your GPS and motor configurations.

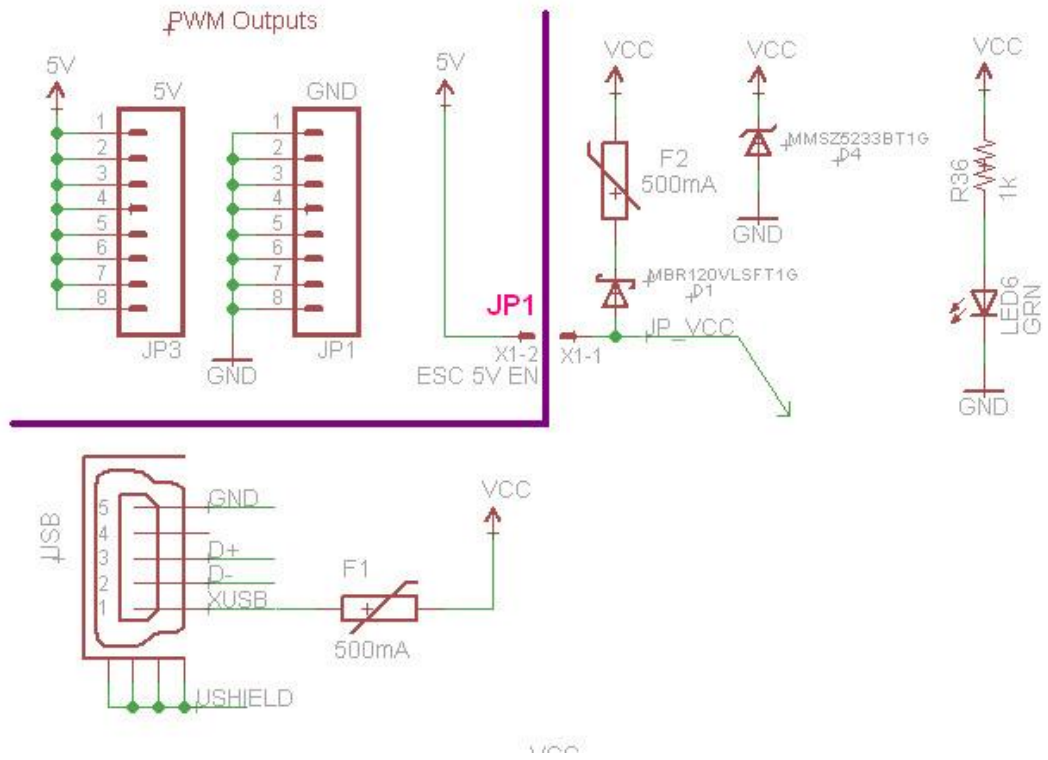
Diode / Fuse problems

A common problem on the APM 2.5 and Arduflyer V2.5 can be blown fuses or diodes on the input rail. This is caused normally by shorting out the 5v rail, or by spikes plugging cables in while live.

In most instances this can be repaired, the components are shown in the picture below. It is important these are replaced with the correct parts as incorrect ones can cause irreparable damage to the board.



A member at Multi-Rotor is offering a repair service for this if you are not confident on soldering and repairing these components. For more information and pricing Contact: gaza07@multi-rotor.co.uk



Mounting flight controller board

From Arducopter 2.9+ mounting of the flight controller board has become critical. The board needs to be mounted in a way that it is isolated from vibrations as best as possible. It is also important that propellers are balanced and that the frame is made as vibration free as possible. This is due to 2.9+ and use of inertial primary control for the Z axis, it is now necessary to take vibration dampening and isolation of the flight control board much more seriously.

There are many ways to achieve this:

- Suspended on elastic bands between four posts
- Gel Pads
- Foam strips
- Rubber bobbins

The effectiveness of the damping can be seen in the data logs from the APM after flight.

For more information on damping please see this excellent thread:

<http://fpvlab.com/forums/showthread.php?4251-Vibration-Dampening-amp-Isolation-Solutions-Guide>

DO NOT HARD MOUNT THE ARDUFLYER OR APM 2.5 TO THE MULTI CHASSIS

First Tests

See this great tutorial, should tell you how to get started.

http://arducopter.googlecode.com/files/APM2_Quad_Setup_3.pdf

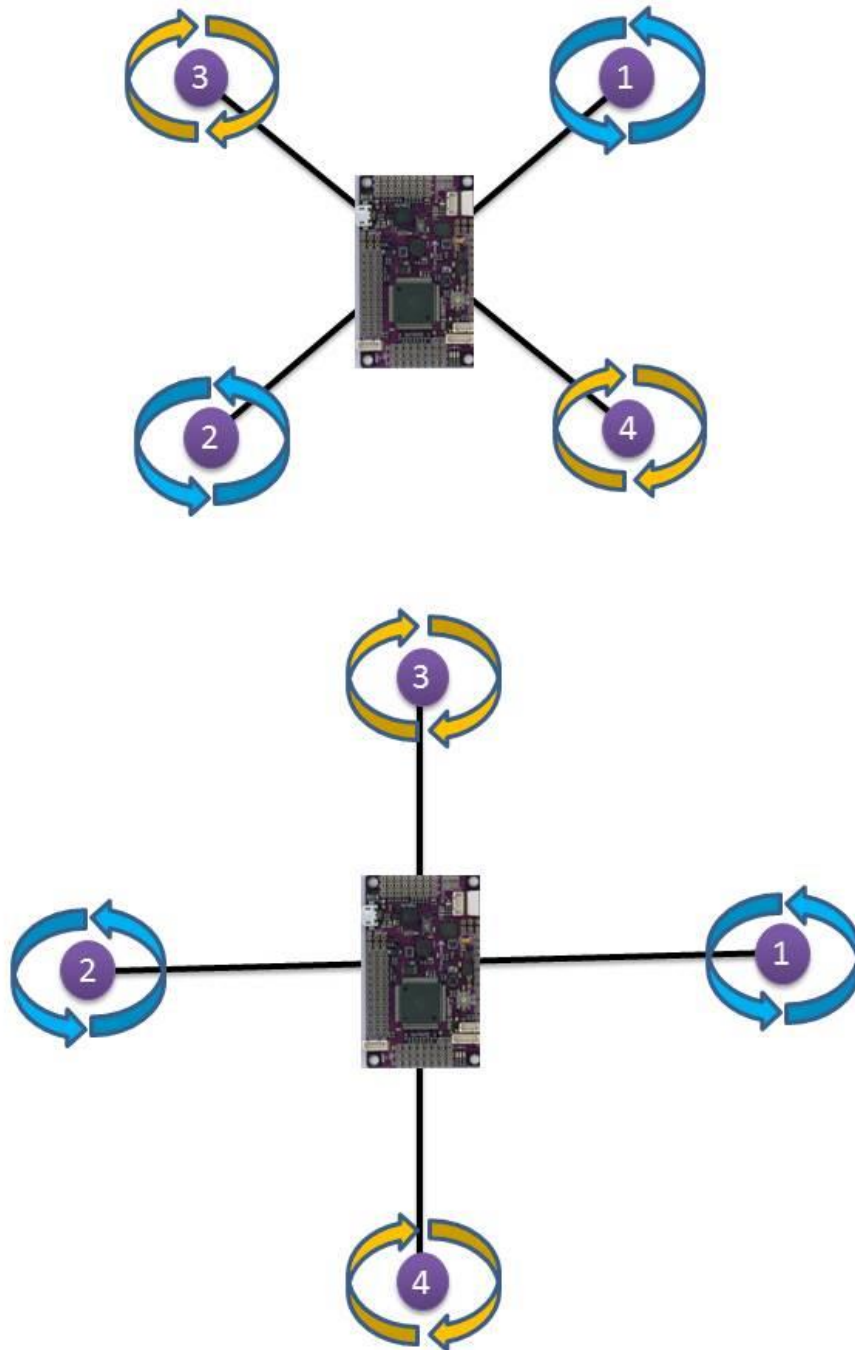
Tuning PIDS

Another great guide and tutorial to PID tuning for APM

http://arducopter.googlecode.com/files/APM2_Quad_Stabilize_1.pdf

PID FAQ for Arducopter 2.9.1+ <http://www.multi-rotor.co.uk/index.php?topic=1385.msg11119;topicseen#new>

Appendix - Motor Connections



For other layouts see: http://code.google.com/p/arducopter/wiki/APM2_Motor_order

Sources & Credits

ArduCopter <http://code.google.com/p/arducopter/>

Mission Planner <http://code.google.com/p/ardupilot-mega/wiki/Mission>

MinimOSD <http://code.google.com/p/arducam-osd/wiki/minimosd>

JD-IO <http://www.buildyourowndrone.co.uk/JD-IO-board-v1-0-Driver-board-p/acq-ioboard.htm>

Multi Rotor UK Forum members <http://www.multi-rotor.co.uk>

All the community on DIYDrones.. <http://diydrones.com/>

And of course all of the people on RCGroups community....

Current Forum Threads on APM 2.5:

<http://www.rcgroups.com/forums/showthread.php?t=1820773>

<http://www.multi-rotor.co.uk/index.php/topic,597.0.html>

<http://www.rcgroups.com/forums/showthread.php?t=1752761>

Accessories & Supplies

APM 2.5

http://store.diydrones.com/APM_2_5_Kit_p/br-ardupilotmega-05.htm

<http://www.buildyourowndrone.co.uk/ArduPilot-Mega-2-5-Kit-p/apm-2.5.htm>

http://www.rctimer.com/index.php?gOo=goods_search_list.dwt&gcat=0&gkey=apm&image.x=0&image.y=0

Ready Made Cables for APM, (GPS and Telemetry)

<http://www.buildyourowndrone.co.uk/Cables-Connectors-s/42.htm>

<http://unmannedtechshop.co.uk/telemetry-adapter-cable-for-apm-2-5-radio-osd-209.html>

Cases

<http://www.buildyourowndrone.co.uk/ArduPilot-Mega-s/36.htm>

Sonar Sensors

<http://www.buildyourowndrone.co.uk/IMU-Sensors-s/25.htm>

<http://unmannedtechshop.co.uk/uav-components/uav-telemetry.html>

3DR Radios

<http://unmannedtechshop.co.uk/uav-components/ardupilot-mega-uk/3dr-433mhz-telemetry-kit.html>

<http://www.eforchina.com/view/120961/Single-TTL-3DRobotics-3DR-Radio-Telemetry-Kit-433Mhz-for-APM-APM2.htm>

GPS

<http://unmannedtechshop.co.uk/uav-components/ardupilot-mega-uk/ublox-lea-6h-gps.html>

<http://www.buildyourowndrone.co.uk/3DR-GPS-LEA-6-p/gps-3drgpslea.htm>

http://www.rctimer.com/index.php?gOo=goods_details.dwt&goodsid=763&productname=